Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

MIS35-07 会場:201A 時間:5 月 24 日 10:30-10:45

マントル対流シミュレーションよって予測される水蒸気脱ガス量について
On the degassing of water vapor inferred from mantle convection simulations

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The degassing process of volcanic activity would be influenced to the formation of surface environment of Earth, which has been argued from simplified and theoretical model of co-evolution of planetary interior and surface [e.g. McGovern and Schubert, 1989; Tajika and Matsui, 1992]. Those models, however, used the parameterized convection model for heat transfer and volatile circulation as well as degassing process. Recent progress of numerical modeling of mantle dynamics can trace the magmatic activity and water circulation over the geologic time-scale [e.g. Nakagawa et al., submitted]. However, such an investigation was not included for effects of melt-phase system such as expressed by the density structure of silicate melt. This effect would be essential for reconciling the thermo-chemical state of early Earth' interior [Labrosse et al., 2007; Lee et al., 2010]. In this study, we attempt to construct global-scale water circulation model in thermo-chemical mantle convection simulations including melt-phase system and degassing-regassing processes over the geologic time-scale. The melt-phase system is based on the density structure of molten silicate found from Stixrude et al. [2009]. Preliminary results found from this study are suggested that huge volcanic activity would be expected in early Earth when the density crossover between solid silicate and molten silicate is assumed in the deep mantle, which the molten silicate is much denser than solid silicate. This also suggests that the degassing rate of water vapor in the early Earth would be more efficient with the denser molten silicate in the deep mantle compared to the less dense case. More detailed results and discussion will be shown in the presentation.

キーワード: 融解相関係, 水循環, マントル対流, 火成活動, 脱ガス
Keywords: Melt-phase system, Water circulation, Mantle convection, Magmatism, Degassing